the chemical reactions, especially oxidations underlying this development. The fact that chloral hydrate inhibits the development of the egg and that nevertheless the toxic effects of this substance upon the egg are inhibited by lack of oxygen or by NaCN indicate that the life-saving action of lack of oxygen in this case is due to the inhibition of chemical processes in the egg.

In former papers I had shown that the unfertilized egg is much more resistant to toxic media than the fertilized egg and I pointed out that this difference might be due to the difference in the rate of oxidation in both types of eggs. O. Warburg found that through fertilization the rate of oxidation is increased six times its original amount in the egg of *Strongylocentrotus;* and Wasteneys and I found that the consumption of oxygen rises in the egg of *Arbacia* to from three to four times its original value through the act of fertilization. We found, moreover, that the amount of NaCN necessary to prevent the development of the egg of *Arbacia* and to prevent the toxic action of the agencies mentioned above reduced the consumption of oxygen in the fertilized egg to from one third to one half the normal rate. The greater tolerance of the unfertilized egg towards these toxic media can therefore be explained by the low rate of oxidation in the egg.

In former papers, and especially in a book published a year ago, I pointed out that the process of membrane formation or a certain alteration of the surface of the egg is the essential cause for the starting of the development of the egg; and I pointed out, also, that this alteration of the surface might increase the permeability of the egg, especially for hydroxylions. It is indeed easy to show that in certain hyperalkaline solutions the fertilized egg of *Arbacia* gives off its pigment much more readily than does the unfertilized egg. R. Lillie, Harvey, McClendon and Lyon have recently published observations which in their opinion prove that the process of membrane formation increases the permeability of the egg. I have found that a mixture of LiCl, KCl and $CaCl_2$ kills the fertilized egg of *Arbacia* even in the absence of oxygen more rapidly than the unfertilized egg, and it is possible that this difference in susceptibility between the unfertilized egg and the fertilized egg in the absence of oxygen is due to the fact that salts (or that part of the salts which undergoes hydrolytic dissociation) diffuse more rapidly into the fertilized than into the unfertilized egg.

Jacques Loeb
Rockefeller Institute,
New York

Oscillations in Electric Discharge

In two papers recently published by the Academy of Science of St. Louis[1] the writer has called attention to oscillations in the air column of a Geissler tube, in connection with the stria. It was shown that the air particles are moving away from the negative terminal in open-air discharge. The Faraday dark space is a convection region. The air particles are supercharged in the region of negative glow, and then the discharge continues by convection across the dark space. The Crookes dark space in a vacuum tube is apparently a region of convection of the corpuscles themselves, before they reach the carriers.

The positive column is a drainage column where the negative discharge is by a conduction transfer from molecule to molecule towards the exhaust terminal. In the positive column, the air molecules are moving in a direction opposite to the drainage flow of the negative discharge.

The critical spark length is the length of the Faraday dark space. Dark convection discharge columns and luminous conduction columns then exist side by side. Electrically they are friendly, but mechanically they jostle each other about, by reason of the fact that the carriers in these columns are moving in opposite directions.

The proofs of these conclusions, which appear conclusive, are furnished in the photo-

[1] *Trans.*, XIX., Nos. 1 and 4.

graphic plates reproduced in the papers referred to. It may be further pointed out that in minute spark gaps, such as are found useful in X-ray circuits, there is an oscillation which appears to promote the discharge. There is strong evidence which is being further examined, that these oscillations are due to an alternation of conduction and convection discharge across the gap. This involves a surging to and fro of the carriers, from one terminal to the other.

Faraday observed that there was no appreciable "electric wind" when a brush discharge becomes somewhat disruptive in character. He appears to have left Franklin's suggestion of a one-fluid theory wholly out of consideration. The mingling of convection and conduction discharges is sufficient to account for the phenomenon which Faraday observed. The brush discharge between two terminals becomes disruptive when the negative terminal is moved into contact with the end of the positive column. If the gap is made still shorter, until the distance between the knobs is equal to the length of the Faraday dark space, the critical spark length has been reached.

In the papers referred to, it was suggested that the stria in the Geissler tube were in the nature of vibrations in an organ pipe. This explanation simply involves the assumption that a wave consists of a dark space and an adjoining luminous segment. These are respectively regions of convection and conduction. They are Faraday dark spaces and positive columns. In them the carriers are moving in opposite directions. The nodal planes where pressure is at a maximum and at a minimum alternately both in space and in time, lie between the dark and luminous segments of the waves. At the instant when the pressure is at a maximum and a minimum at adjoining nodes, the convection transfer is zero. The conduction transfer will at that instant be at a maximum and a minimum at consecutive nodes. These conditions may explain the displacement of the striations which have long ago been observed.

FRANCIS E. NIPHER

THE INTERNATIONAL GEOLOGICAL CONGRESS AT STOCKHOLM

THE success of any great gathering of geologists may fairly be gauged by the men brought together, by the interest of the problems illustrated on the excursions, by the comfort and the pleasures of the entertainment, and lastly, it would seem, by the papers, conferences and discussions. Measured by all of these standards, the eleventh International Geological Congress, which was held in Stockholm during the month of September, will take a high rank among international scientific gatherings. The number of geologists in attendance was in excess of seven hundred, and the distinction of the names represented was noteworthy. From Germany came such men as Beck, Bergeat, Beyschlag, Credner, Groth, Keilback, v. Koenen, Penck, Rothpletz, Rudolph, Salomon, Sapper, Steinmann, Wahnschaffe and Walther; from Austria-Hungary, Brückner, Diener, v. Cholnoky and Tietze; from Canada, Adams, Coleman and Miller; from Denmark, Stunstrup and Ussing; from Egypt, Hume; from France, Barrois, Prince Roland Bonaparte, Haug, Kilian, Lory, de Margerie and Termier; from Great Britain, Cole, Garwood, Gregory, Horne, Oldham, Peach, Sollas, Strahan and Teall; from Italy, Baldacci, Capellini de Stefani and Mattirolo; from Japan, Inouye; from Mexico, Aguilera and Ordoñez; from Norway, Brögger, Reusch and Vogt; from Russia, Andrussow, Loewinson-Lessing and Tschernyschew; from Finland, Frosterns, Ramsay and Sederholm; from Sweden, Gunnar Anderssen, J. G. Anderssen, Bäckström, de Geer, Hamberg, Sven Hedin, Högbom, Holmquist, Lindbahm, Moberg, Nathorst, Nordenskiöld and Sernander; from Switzerland, Baltzer, Brunhes, Heim, Lugeon and Schmidt (Carl). The roll from the United States included Bascom (Miss), Becker, Bryant, Cross, Day (A. L.), Emmons, Fenneman, Grabau, Hague, Hobbs, Irving, Kemp, Lindgren, Newland, Reid, Richards, Smith (G. O.), Spencer (J. W.), Tarr, Van Hise, Winchell (H. V.) and Wolff.

The Swedish people enjoy a wide interna-